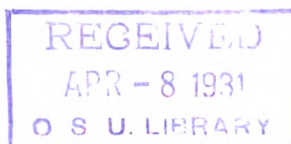


DEPARTMENT OF COMMERCE
UNITED STATES BUREAU OF MINES
SCOTT TURNER, DIRECTOR

INFORMATION CIRCULAR

SAFETY CARS OF THE
UNITED STATES BUREAU OF MINES



BY

J. J. FORBES AND M. J. ANKENY

INFORMATION CIRCULAR

DEPARTMENT OF COMMERCE - BUREAU OF MINES

SAFETY CARS OF THE UNITED STATES BUREAU OF MINES¹

By J. J. Forbes² and M. J. Ankeny³

One of the main functions of the U. S. Bureau of Mines, as authorized by Congress, is to investigate safety and health conditions, to disseminate information regarding safe and unsafe practices in mining, and to aid in improving safety and health conditions of mining communities and in promoting the welfare of the miner. Among several methods of reaching the miner and interesting him in safety work, perhaps the most effective is through the 11 mine safety stations and 11 railroad cars known as mine rescue, or more correctly, mine safety cars.

THE SAFETY CARS

Frequently, the Bureau of Mines receives requests for information regarding the purpose, equipment, personnel, and construction of its safety cars used in the field service. It is the intention of this circular to present to the mining public in particular, and to the public in general, some definite information regarding these safety cars and their functions.

The cars are operated throughout the mining fields of the United States and are headquartered as follows (see fig. 1): Car 1, Reno, Nev.; Car 2, Raton, N. M.; Car 3, Pittsburgh, Pa.; Car 4, Terre Haute, Ind.; Car 5, Pineville, Ky.; Car 6, Pittsburg, Kans.; Car 7, Huntington, W. Va.; Car 8, Duluth, Minn.; Car 9, Butte, Mont.; Car 10, Des Moines, Iowa; Car 11, Anchorage, Alaska.

Service at Mine Disasters

One of the most important purposes of the U. S. Bureau of Mines safety cars is to render service at mine fires and explosions where human life is endangered. State mine inspectors and other interested persons are supplied with itineraries of the car operating in their districts from time to time, so that they may know at all times where the car can be found in case of emergency. When these disasters occur the car may be reached direct or through its field headquarters, and upon receiving word of a mine disaster, or request for assistance, it immediately proceeds to the scene of trouble. Frequently a special locomotive is supplied by the railroads and in many instances the movement of the car is given the right of way over all other railway traffic. Upon reaching the destination, the facilities and personnel of the car are immediately available for rescue and recovery operations.

Following most mine disasters a thorough investigation is made by engineers of the Bureau of Mines, and a confidential report is submitted to the operator. The information gained in this manner from a large number of mine fires and explosions, together with the knowledge gained from the experimental work carried on at the Experimental mine of the bureau at Bruceton, Pa., serves as a basis upon which the bureau is able to recommend preventive measures whereby similar occurrences may be averted. The bureau car is often used as headquarters for the investigating engineer when such an examination is being made.

1 The Bureau of Mines will welcome reprinting of this paper provided the following footnote acknowledgment is used:
"Reprinted from U. S. Bureau of Mines Information Circular 6435."

2 Supervising engineer, safety division, U. S. Bureau of Mines.

3 Senior foreman miner, U. S. Bureau of Mines.

Safety Inspections

The Bureau of Mines safety car is at times used as a headquarters for bureau engineers when making safety investigations at mines. At the request of an operating company, or at least with its consent, bureau engineers make complete accident-prevention studies at mines, after which a report, also confidential, is submitted to the operator through the Director of the Bureau of Mines. In this report, explosion hazards and other dangers to life and property are pointed out, with recommendations as to how these hazards may be minimized. It is largely through studies of this kind that the bureau is able to keep in touch with the progress that is being made in the mineral industries in accident-prevention work, and the confidential reports made to the operators are used to disseminate the information which is assembled by the bureau's laboratory and field work.

First-Aid and Mine-Rescue Training

First-aid and mine-rescue training has been one of the main safety activities of the personnel of the Bureau of Mines ever since its inception. Until the past four or five years it was the practice to train selected groups of miners in first-aid so that they could render temporary relief and safely transport injured workers. In recent years, first-aid training has been gaining more and more recognition as being good accident-prevention training, hence, instead of training selected groups of men at an operation, the present-day practice includes the training of all or practically all persons at an operation.

To fulfill the current demand for first-aid training would be an impossibility if the old system of training only by bureau representatives were followed. During the past three years a cooperative plan has become popular, making it possible to fulfill in large part requests for training, and at the same time to train a much larger number of men each year. This cooperative plan, as it is commonly known, may be described as follows: A number of selected men from a mine or from several mines of a district are brought together in a class and given an intensive course of first-aid training by a bureau instructor, with the idea that from among this group of men those most adaptable will be selected to act as first-aid instructors. Considerable time and effort is expended in developing a number of instructors in this group. After this training has been completed the men organize classes in first-aid among the workers of their respective organizations and train them under the supervision of the Bureau of Mines representative. The classes are limited in size and generally are so arranged that each session of each class may be visited by the bureau instructor. The plan not only permits a much larger group of men to be trained at any individual mine or plant, but leaves a number of qualified instructors who are capable of maintaining the work after the car or bureau representative has left the district. The bureau cars are utilized to advantage for this type of work.

Many State-owned and privately owned mine-rescue stations are maintained throughout the United States. The personnel of the bureau safety car is often called upon to train the members of crews attached to these stations. In many instances, in which mines or plants are not equipped with oxygen breathing apparatus, progressive far-seeing managers desire to have men trained in the use of such apparatus for availability in case of emergency such as fire or explosion; the equipment on the car is available for this purpose and this phase of activity includes not only the large mines or plants but also the small mine or plant in the isolated localities. Mine-rescue training throughout the country has been fostered chiefly through the activities of the bureau's cars during the past 20 years and has now developed to such an extent that enough trained men are available in almost any mining region to take care of mining catastrophes which may occur in that region.

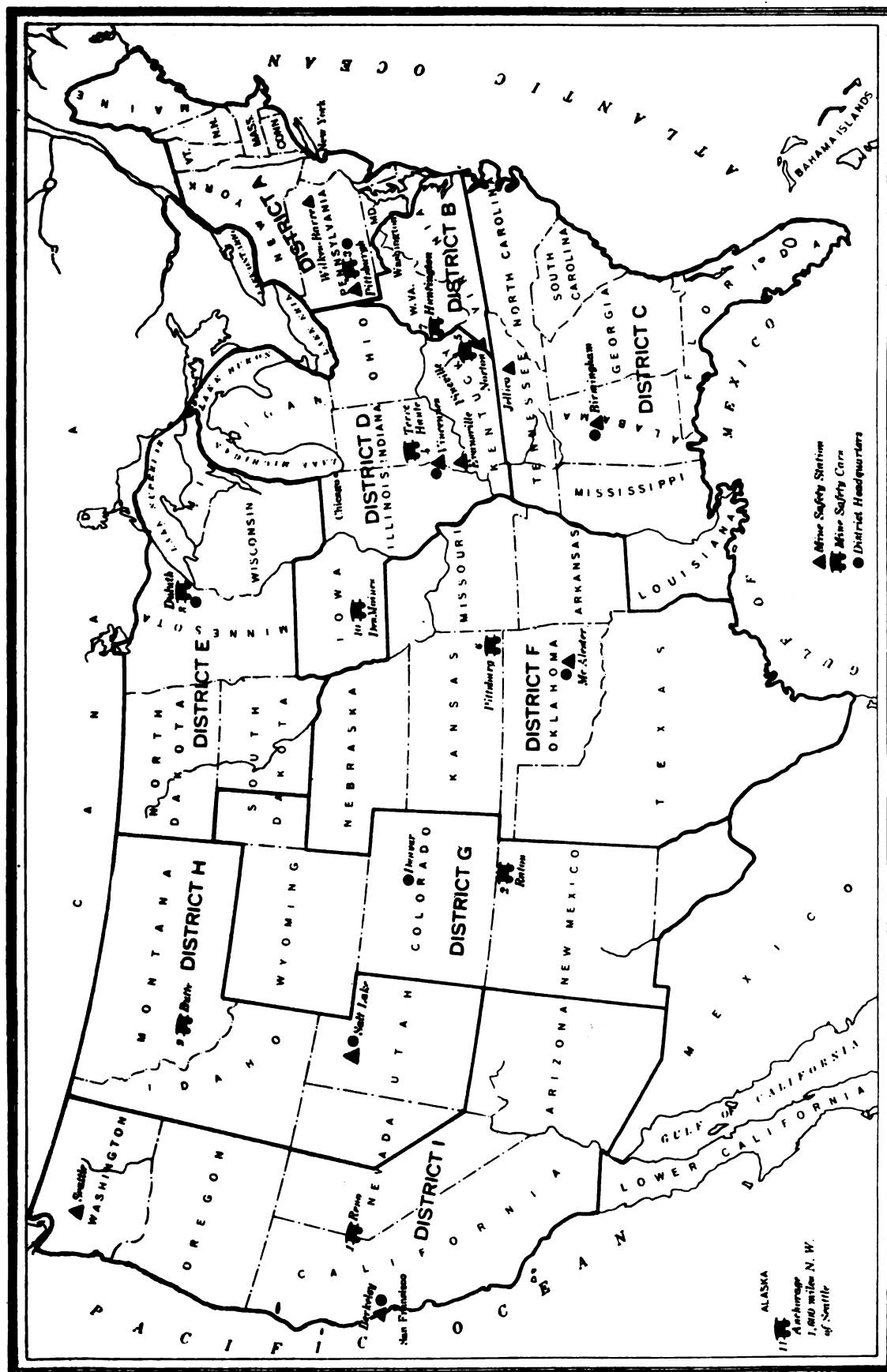


Figure 1.-- Map of United States showing districts, district and mine safety car headquarters, and location of mine safety stations, safety division, U. S. Bureau of Mines

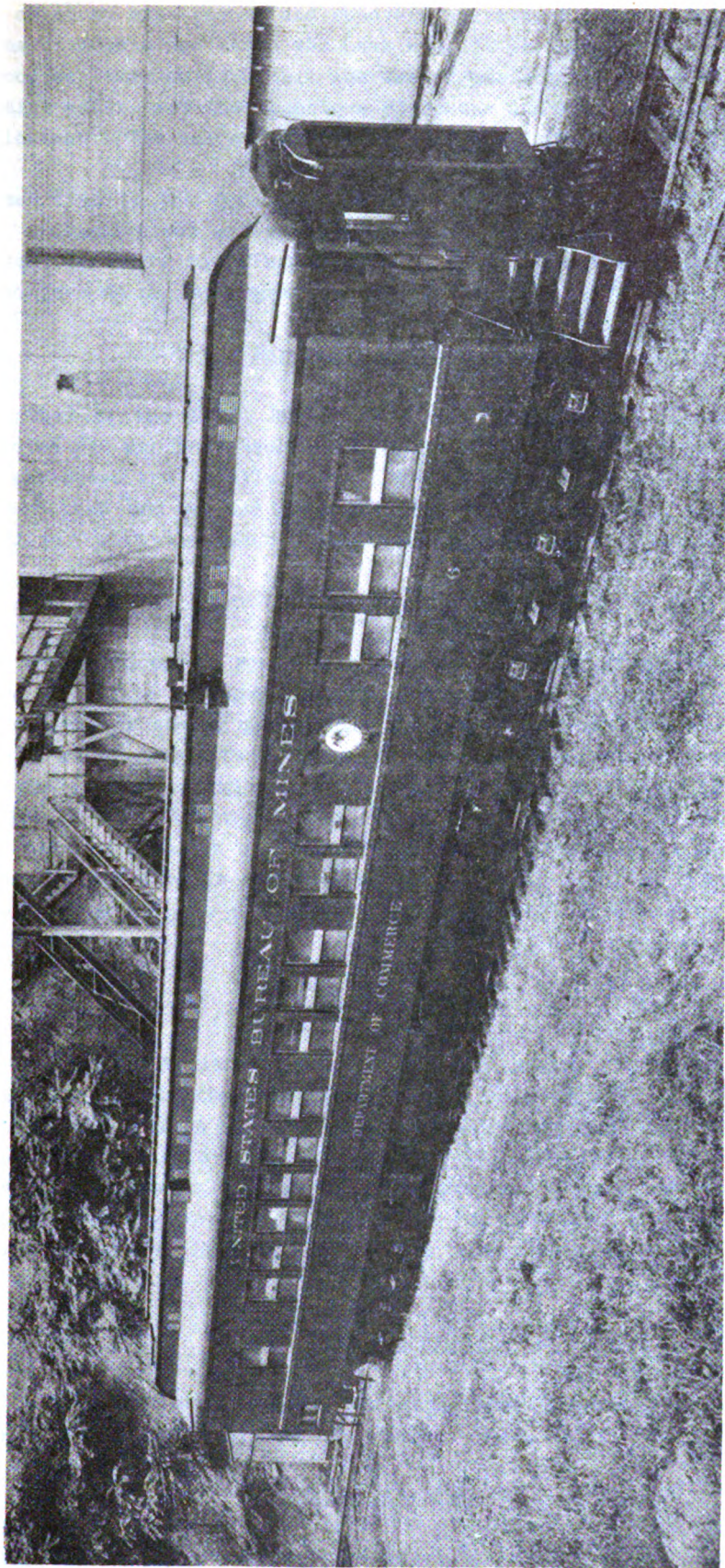


Figure 2.- View of all-steel mine rescue car

The Bureau of Mines has recently developed and put into the field a new course, known as "the advanced mine-rescue and recovery operations course, which was especially designed for mine officials and those who have had actual experience at mine fires and explosions. This course takes up in detail the use of protective and detective devices, methods of analyzing mine gases, and the technique of rescue and recovery operations following mine fires and explosions. The use of the bureau's cars aids much in the giving of this course.

In addition to the foregoing outline of work, the car personnel is often called upon to assist at local plant safety meetings, first-aid contests, and exhibits at State and industrial fairs; in fact, there are now fairs or other gatherings which annually use the Bureau of Mines cars as an important part of the exhibit.

Personnel and Equipment

The staff of the U. S. Bureau of Mines safety cars and stations is composed of carefully selected men who have had considerable mining experience or appropriate technical training; new employees are usually given a course of training at the Pittsburgh Experiment Station of the bureau and at the Experimental Mine at Bruceton, Pa., so that they are thoroughly familiar with the special features of the bureau's safety work and policies.

Car Engineer

Most of the Bureau of Mines safety cars have a qualified mining engineer in charge of the car; his duties are to supervise the work of the car personnel, to make safety investigations and reports of mining operations, to make disaster investigations and reports, to assist with local safety activities where the car happens to be stationed; and he assists at mine disasters and in many instances is called upon to take charge of the rescue and recovery operations following mine disasters. The car engineer is ever on the alert for developments concerning the safety or health of those employed in the mineral industries and is expected to transmit this information in the form of confidential reports to the Bureau of Mines at Pittsburgh and Washington. In many cases the information is given to the public in mimeographed or printed form.

Foreman Miner

The foreman miner is responsible for the upkeep of the mechanical and special equipment on the car and in the absence of the engineer he has full charge of the car and personnel. It is his duty to see that adequate materials and supplies are on hand at all times and he has supervision over the clerical work in connection with the operation of the car. He instructs classes in the use of self-contained oxygen breathing apparatus, in advanced mine-rescue and recovery operations, and in first-aid. He is also called upon to assist at mine fires and explosions and in some cases makes mine or other examinations and reports.

First-Aid Miner

The first-aid miner conducts and supervises classes in first-aid training and assists the foreman miner with his duties whenever possible.

Steward - Chef

Each car carries a steward-chef whose duty is to keep the car in a clean and sanitary condition at all times, make up the berths, wash windows, and prepare and serve all meals for the car staff.

Equipment

Complete mine-rescue and training equipment is carried on each car. The minimum amount of this special equipment includes 12 sets of self-contained oxygen breathing apparatus of a permissible type; electrically driven oxygen pump for charging apparatus; a number of cylinders of oxygen; 6 sets of all-service gas masks with an adequate supply of spare canisters; 2 oxygen inhalers to be used in connection with artificial respiration; 2 army stretchers; 4 canaries and 2 carbon-monoxide detectors; 1 Orsat apparatus for the analysis of mine atmosphere; 1 volumeter for the quick determination of combustible material in mixtures of mine dust; 6 permissible flame safety lamps; 12 permissible electric cap lamps; 1 life-line; 1 pyrotannic-acid carbon-monoxide indicator for the determination of small percentages of carbon monoxide in blood and air; 1 geophone; 1 sling psychrometer; 1 anemometer; and many other special devices. The car is also equipped with necessary household fixtures such as chairs, tables, linens, dishes, tableware, cooking utensils and cutlery, and at time of disaster eating accommodations frequently are provided for 20 or more persons at every meal.

Construction of Car

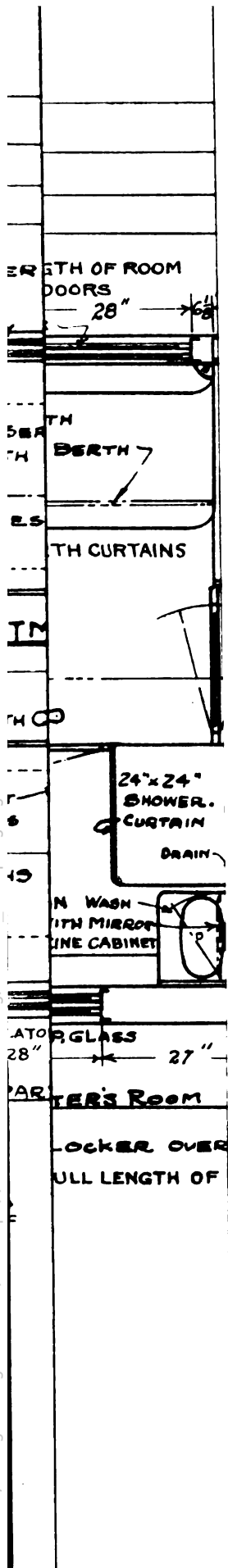
Formerly all safety cars of the U. S. Bureau of Mines were constructed of wood, but these old wooden cars have gradually been replaced by modern all-steel cars. At present all cars in the service are of steel construction, except the one operating in Alaska.

Car No. 6 is the newest car in the service of the Bureau of Mines. This car was completed and put into service about September 15, 1929. It was built by the St. Louis Car Co. in its shops at St. Louis, Mo. In the design and construction of this car are embodied many of the latest features of safe and efficient railroad car construction. Figure 3 is a plan of the car.

The car frame is constructed of heavy steel designed to meet the requirements of the Post Office Department for resistance to collision or overturning. The frame is practically proof against telescoping, as it consists of heavy steel castings and rolled steel shapes and plates. The Commonwealth cast-steel body bolsters and platforms which are used in connection with Commonwealth cast-steel ends for the body are the latest development of safety car building. The vestibule-end framing is of rolled steel structural forms and plates. The cast-steel platforms and bolsters are connected by deep fish-belly center sills and rolled "Z" and angle side sills. Vestibule end posts are set in pockets in the platform casting and are braced at the top by structural channels extending to the cast-steel end and to the side plate. This careful construction would make it necessary to destroy the vestibule frame before material damage could be done to the body end casting.

The sides are framed with "Z" and angle side sills, "Z" top plates, and structural channel side posts. The side sheeting is made up of copper-bearing steel as a preventive against corrosion. Posts and windows are placed to suit the various compartments of the car, which in turn are arranged to give a number of wide piers. These, in conjunction with the numerous cross partitions, make the car so strong that there is little possibility of damage to its contents except in the heaviest of collisions.

The regular car equipment includes a miner 5Px draft gear, miner class B-10 friction buffers, Westinghouse air brakes, Pullman pressure water system, Westinghouse automatic gas electric lighting, electric refrigerator, air compressor, and a dual hot-water heating system.



The interior of the car is painted in light, pleasing shades. The furniture is of mahogany. The interior is divided into compartments that experience has shown to be best suited to the needs of the service, as follows:

Demonstration Room

The demonstration room is equipped with metal tables, lockers, drawers, and cabinets to contain the apparatus used in demonstrating and instructing mine-rescue crews in the work carried on by the bureau. Complete equipment used by the staff in its mine-rescue work is carried in this part of the car at all times when it is not in actual use. In one corner of the demonstration room is a book-case which contains a complete set of bound volumes of publications of the U. S. Bureau of Mines. This library is invaluable to the car personnel for reference purposes. The demonstration room is also used as a workshop for the care and maintenance of the special equipment. The 100 cubic foot capacity oxygen shipping cylinders are kept in this room and in front of these cylinders, is the oxygen pump which is used to charge the oxygen breathing apparatus cylinders from the large cylinder.

Sleeping Quarters

The sleeping quarters for the staff adjoin the demonstration room. It is a double section, containing two lower and two upper berths. This section is arranged so that it can be used as a private conference room or lounge.

Office Compartment

The office compartment is located between the sleeping and dining compartments. It is equipped with an executive desk, a secretary's desk containing typewriter, bookcases, wardrobe, and a sofa couch which can be made into an upper and lower berth. A corridor is placed at one side of office so that the staff will not be disturbed by those passing from one end of the car to the other. On the dining room side of the office is the staff toilet, with an entrance from both the office and the corridor. The toilet room is equipped with a lavatory, small tub and shower bath, and flush hopper.

The dining room is entered from the corridor at the side of the office. It contains an extension table, chairs, folding table, china closet, bookcase, and a sofa couch which can be made into an upper and lower berth.

The porter-chef's room is located between the dining room and the kitchen. This compartment is equipped with a sofa couch, an upper berth, shower bath, lavatory, hopper, and wardrobe.

The kitchen is completely equipped for long runs and long lay-overs at mining plants. It contains a range, extra capacity coal bin, overhead water tanks, sink, dry food and vegetable lockers, work table, dish racks, lockers, and ventilating fans. The electric refrigerator is in the vestibule next to the kitchen.

The electrical system is so arranged that the car can be operated independent of any outside source of electricity; however, it is equipped with a transformer and suitable switching arrangements which make it possible to use 110 or 220 volt alternating current when available, making it unnecessary to operate the car power plant at such times. Special connectors with cable and plugs are provided for plugging in on local sources of supply when a car is in yards or at mine heads for extended stops.

The features outlined enable the car and crew to make long runs and stay at mining plants for long periods without undue fatigue or danger to health. The cars have traveled as much as 42,000 miles in a year, individual cars ranging from 1,500 to 8,000 miles.